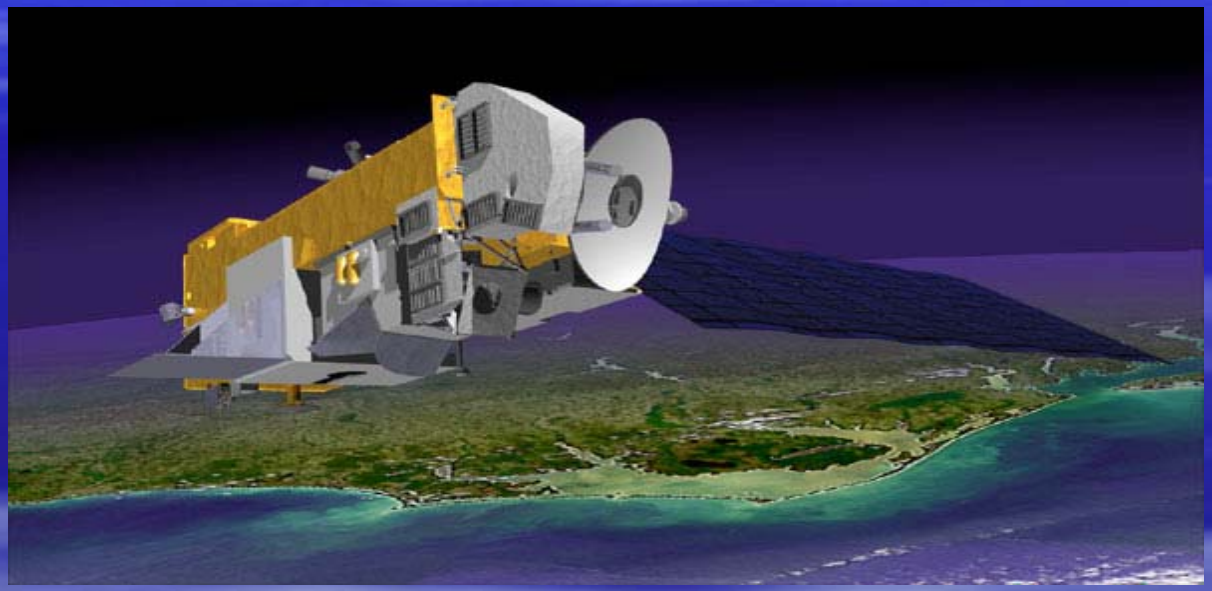
Comparison between HIRDLS and MIPAS Radiances and Key Retrieved Species

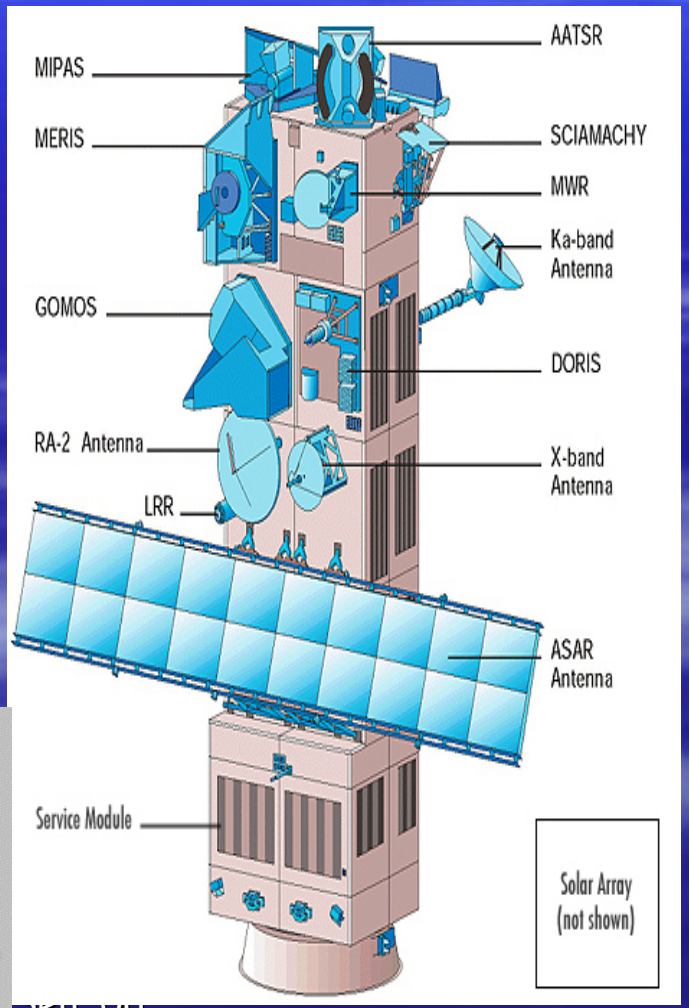


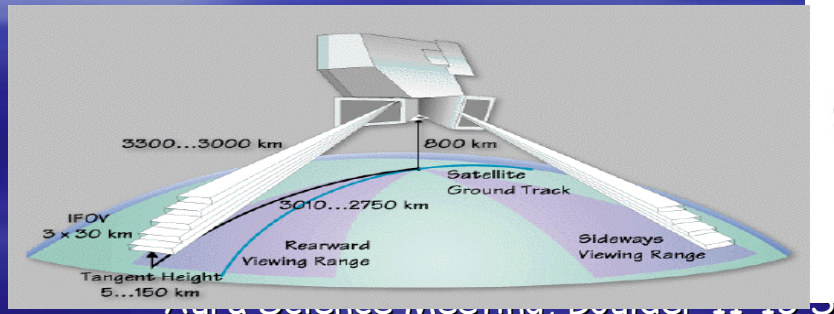
Claire Waymark
University of Oxford: Anu Dudhia, John Barnett and Fred Taylor
University of Colorado: John Gille, Cheryl Craig and Rashid Khosravi
+ HIRLDS team
+ MIPAS team

Aura Science Meeting, Boulder 11-15 Sep 06

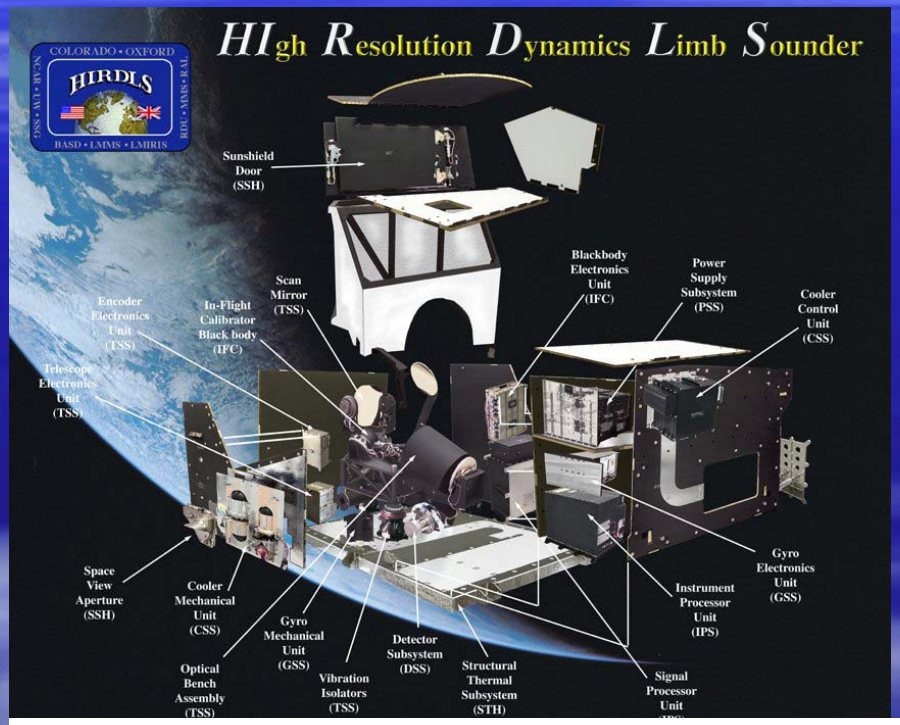
The Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)

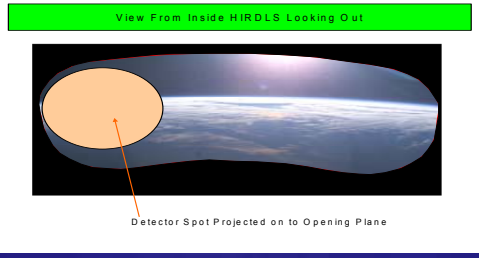
- Launched on ESA's ENVISAT in March 2002
- Fourier Transform spectrometer
- Measures in the infrared
- Uses limb geometry
- Scans sequentially through atmosphere
- Routine products are pressure temperature, O_3, H_2O, HNO_3, CH_4, N_2O and NO_2.
- Reduced resolution of 0.0625 cm^{-1}

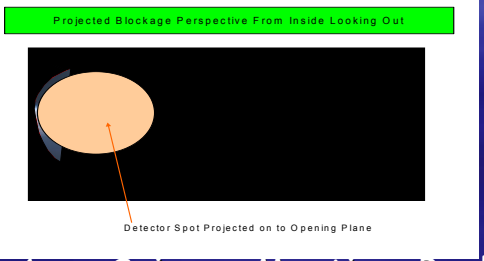




The High-Resolution Dynamic Limb Sounder (HIRDLS)

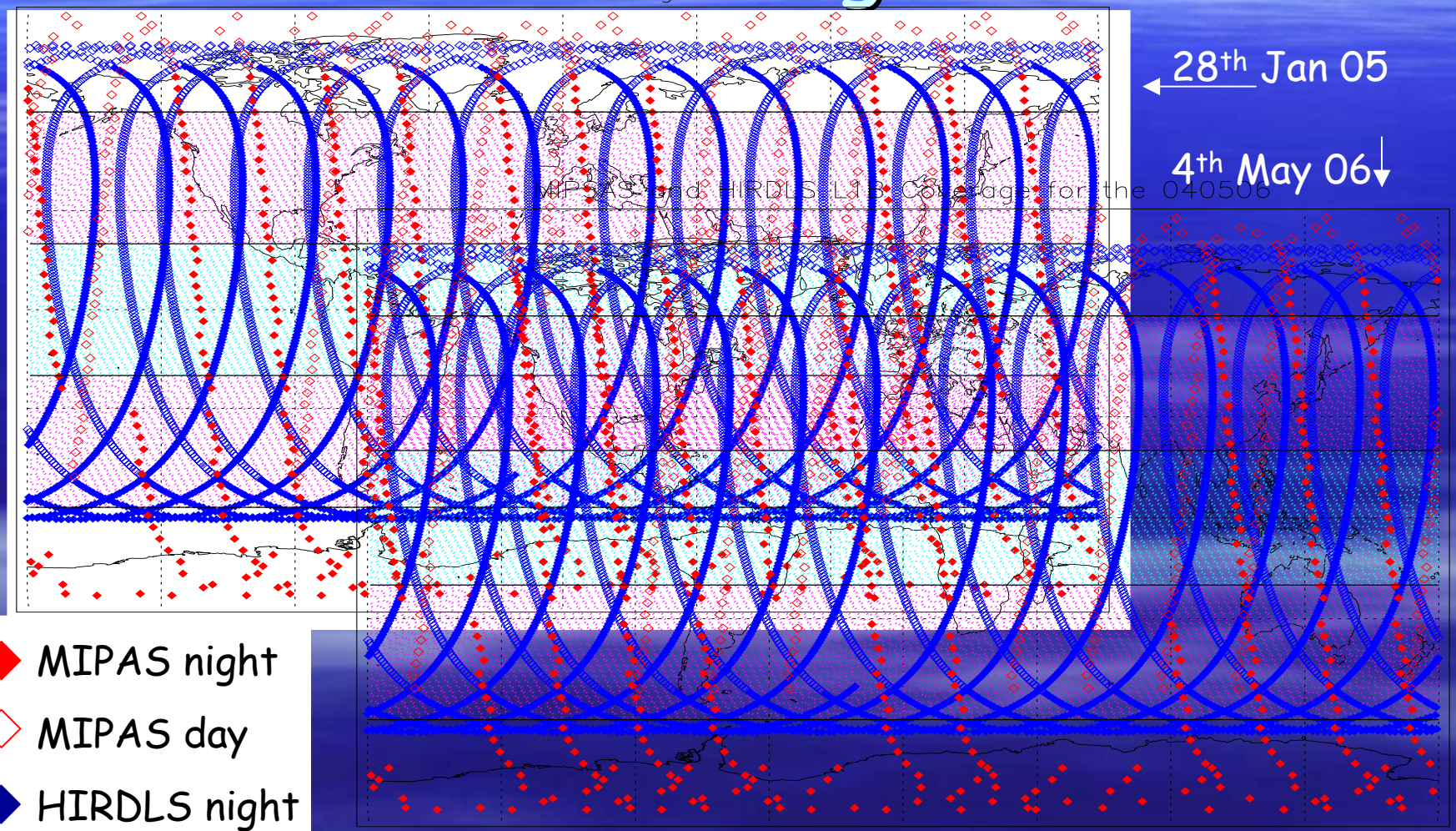




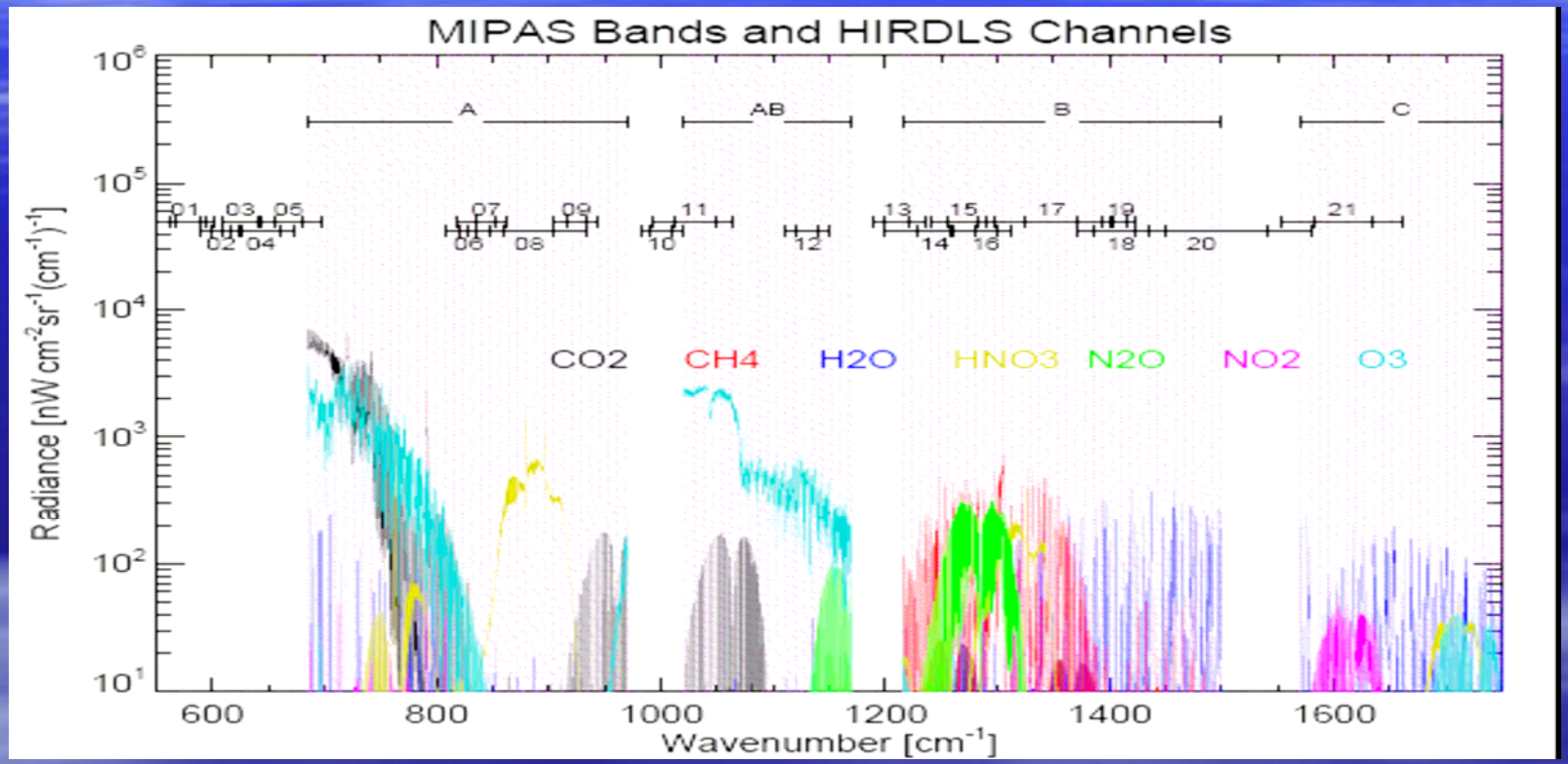


- Launched on AURA in July 2004
- Limb geometry
- Measures in the infrared
- Radiometer - fixed spectral channels
- Each channel targets a specific species
- Obstruction cover all but ~20% on one viewing angle.
- Planed routine products are pressure temperature, O3, H2O, HNO3, CH4, N2O, NO2, N2O5, ClONO2, F11 and F12

HIRDLS and MIPAS coverage



HIRDLS and MIPAS Spectral Coincidences



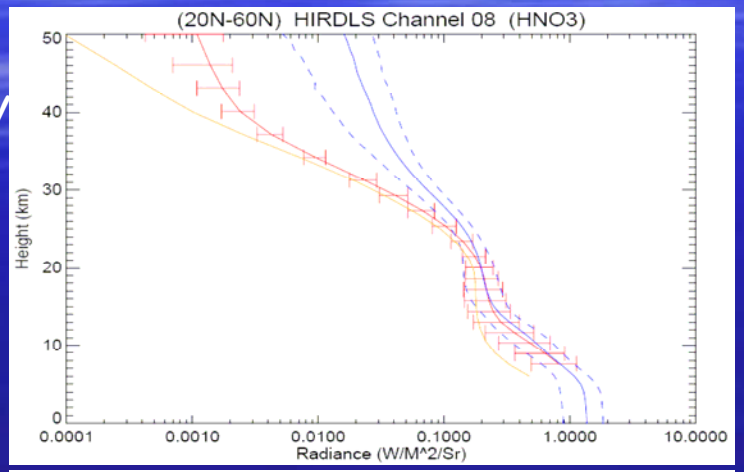
- 10 HIRDLS channels completely overlap the MIPAS spectrum.
- No temperature channel overlap.

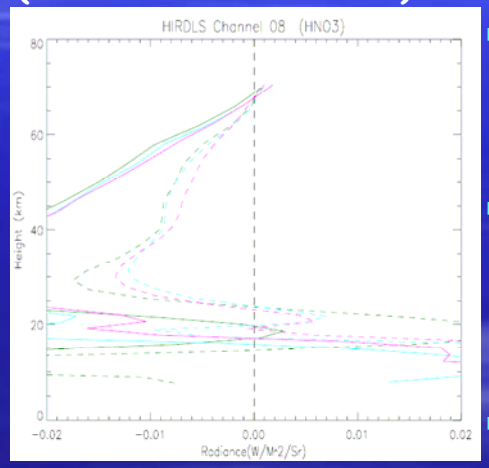
Radiance Comparison: Channels 8

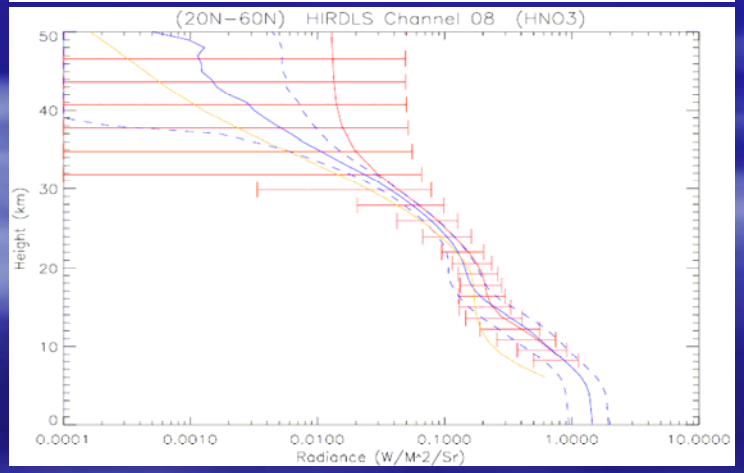
28th January 2005

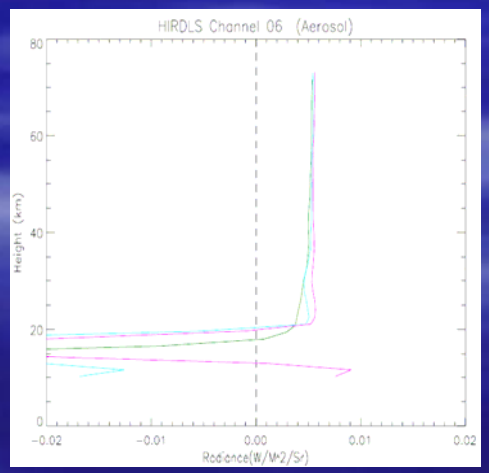
4th May 2006

Residuals
(MIPAS - HIRDLS)/MIPAS









- Comparisons use radiances that go into the v2 processing
- Except for dashed residuals which use radiances used for a previous internal processing version
- Different colour residuals represent the latitude bands 20-60N, 20S-20N and 20-60S.

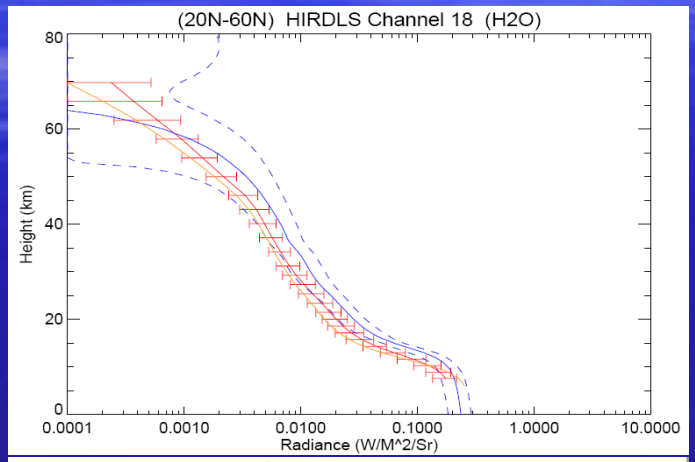
20-60N
20S-20N
20-60S

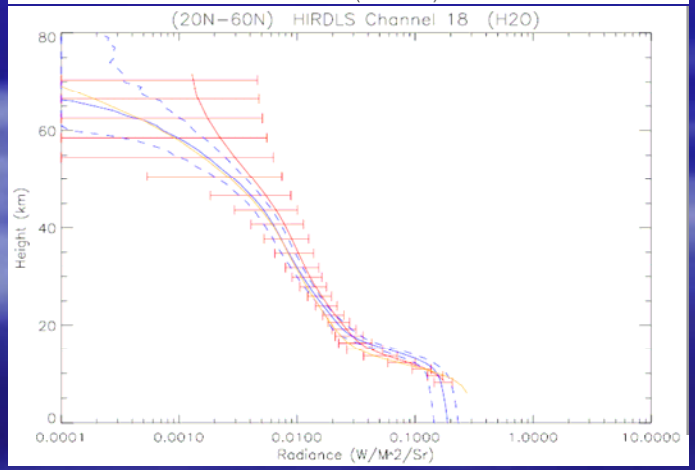
HIRDLS. MIPAS

Radiance Comparison: Channel 18

28th January 2005

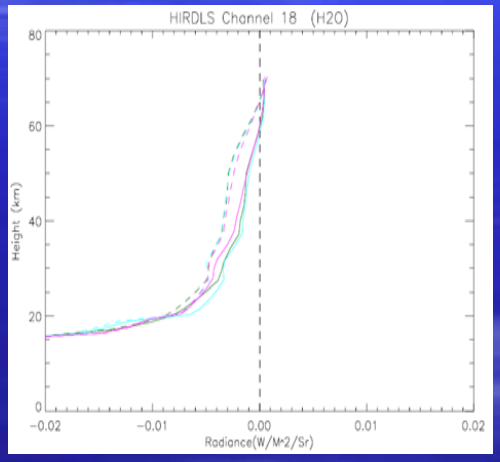
4th May 2006

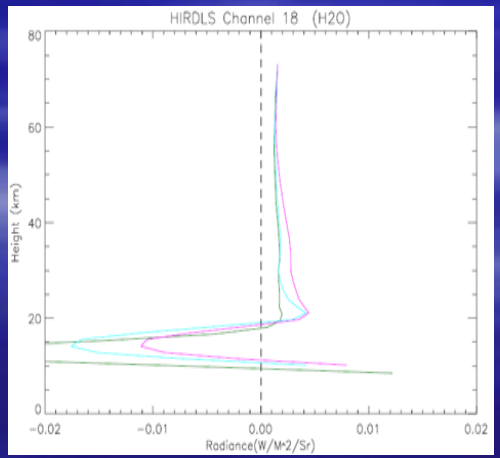




HIRDLS. MIPAS

Residuals
(MIPAS - HIRDLS)/MIPAS





- Comparisons use radiances that go into the v2 processing.
- Except for dashed residuals which use radiances used for a previous internal processing version
- Different colour residuals represent the latitude bands 20-60N, 20S-20N and 20-60S.

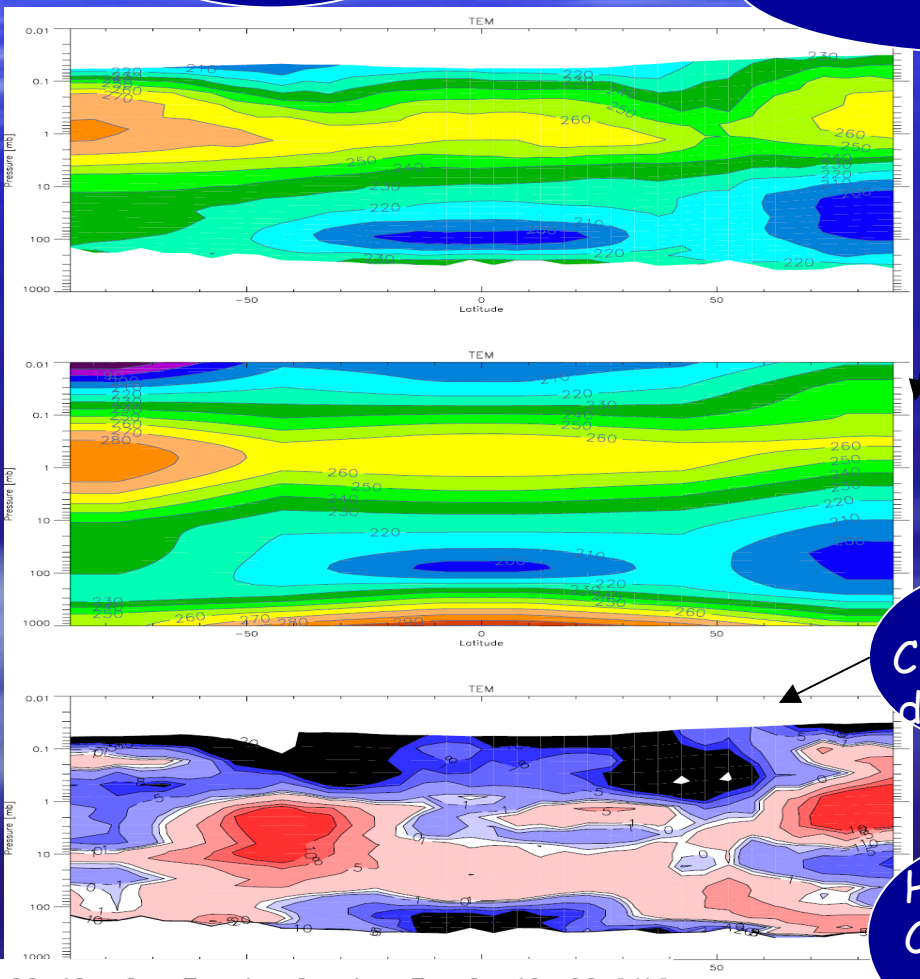
20-60N
20S-20N
20-60S

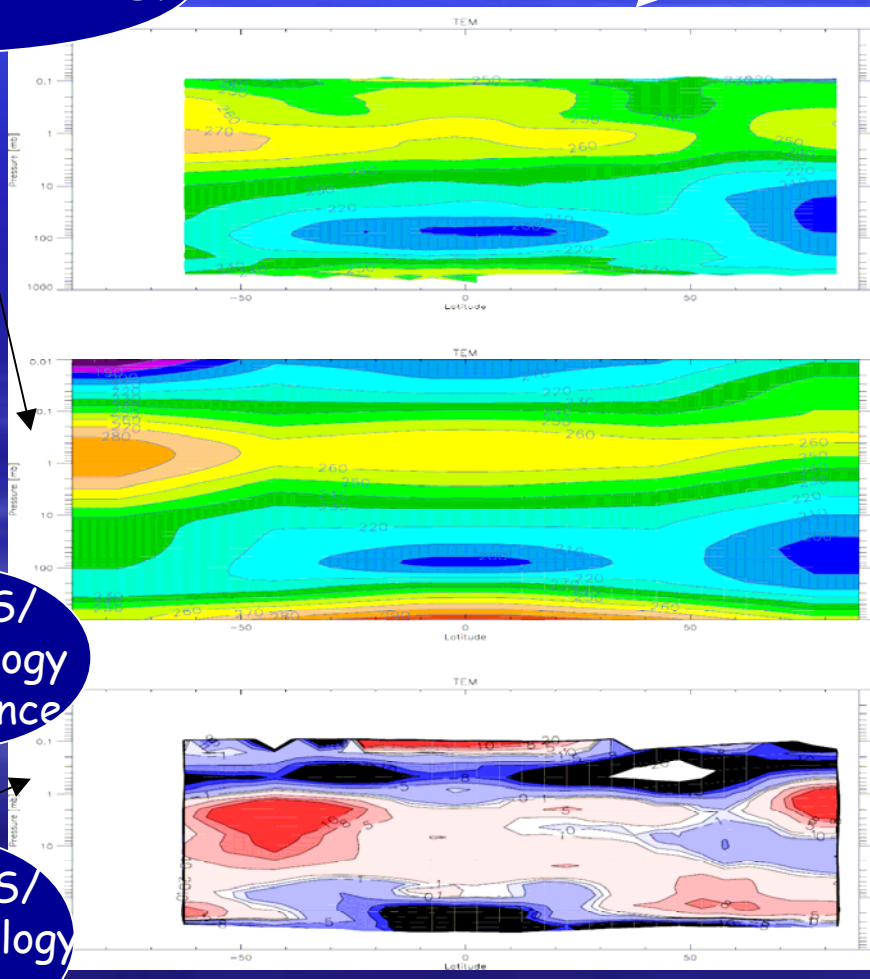
Temperature Climatology comparison

MIPAS

MIPAS Climatology

HIRDLS





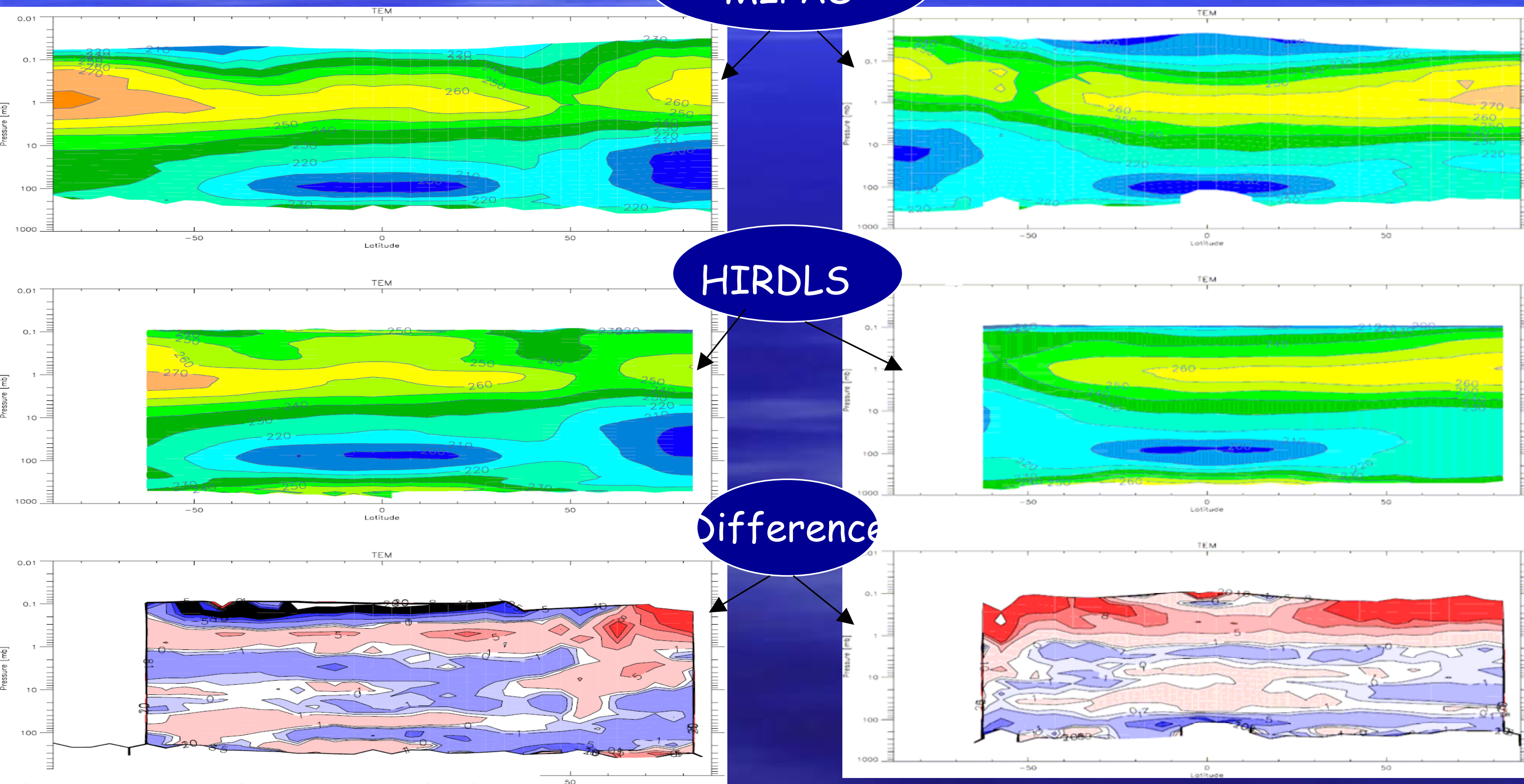
MIPAS/ Climatology difference

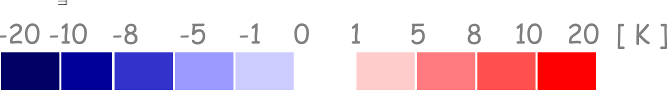
HIRDLS/ Climatology difference

-20 -10 -8 -5 -1 0 1 5 8 10 20 [K]

Temperature retrievals comparison

28th January 2005 — 4th May 2006



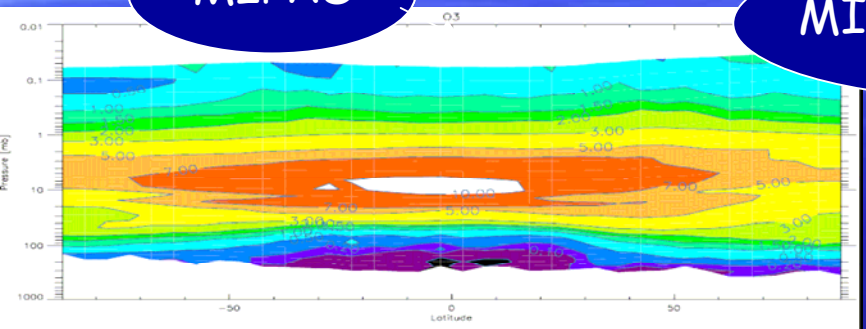


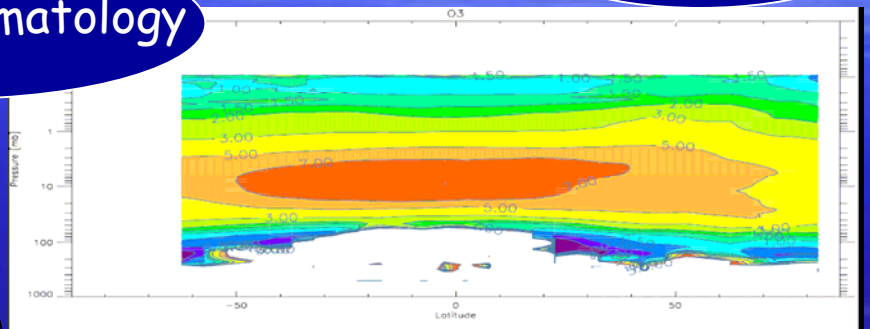
Ozone Climatology Retrieval

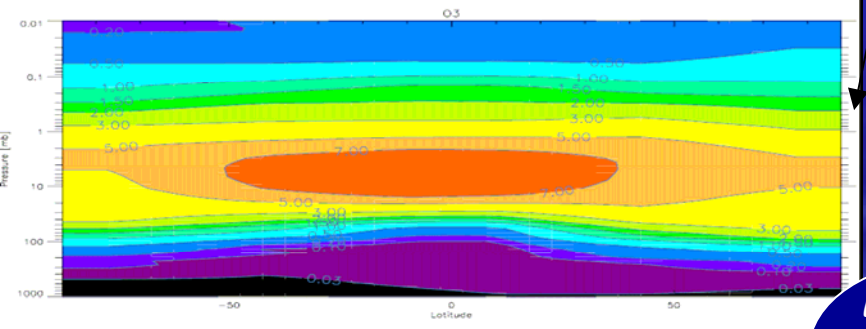
MIPAS

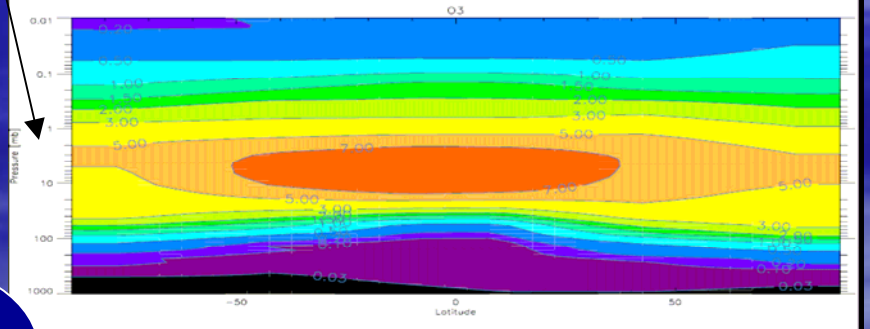
MIPAS Climatology

HIRDLS

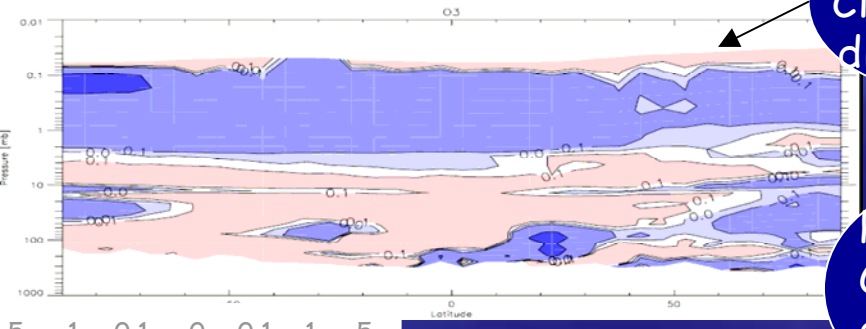


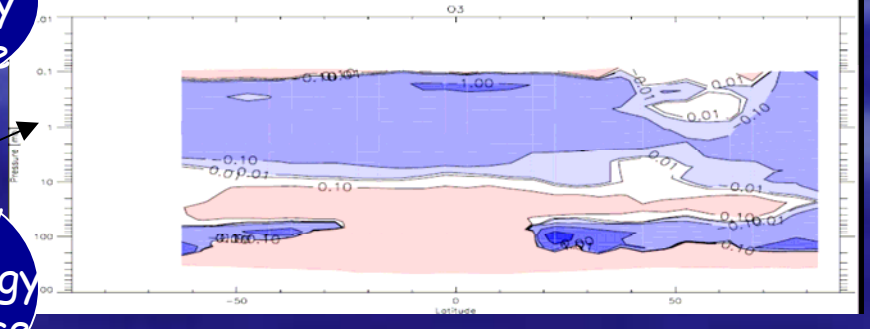






MIPAS/ Climatology difference



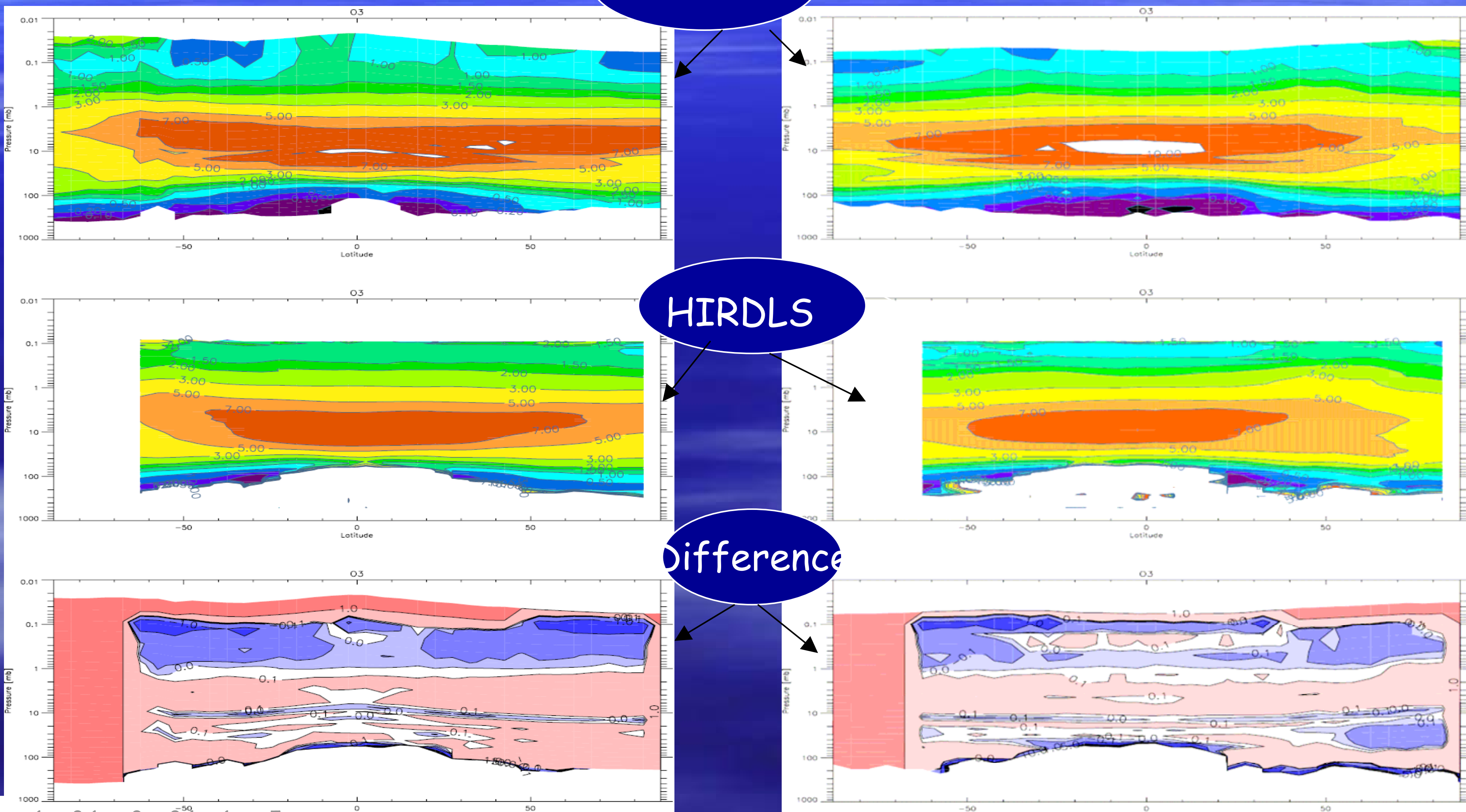


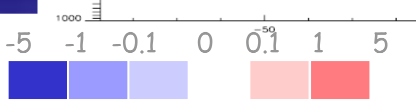
HIRDLS/ Climatology difference

-5 -1 -0.1 0 0.1 1 5

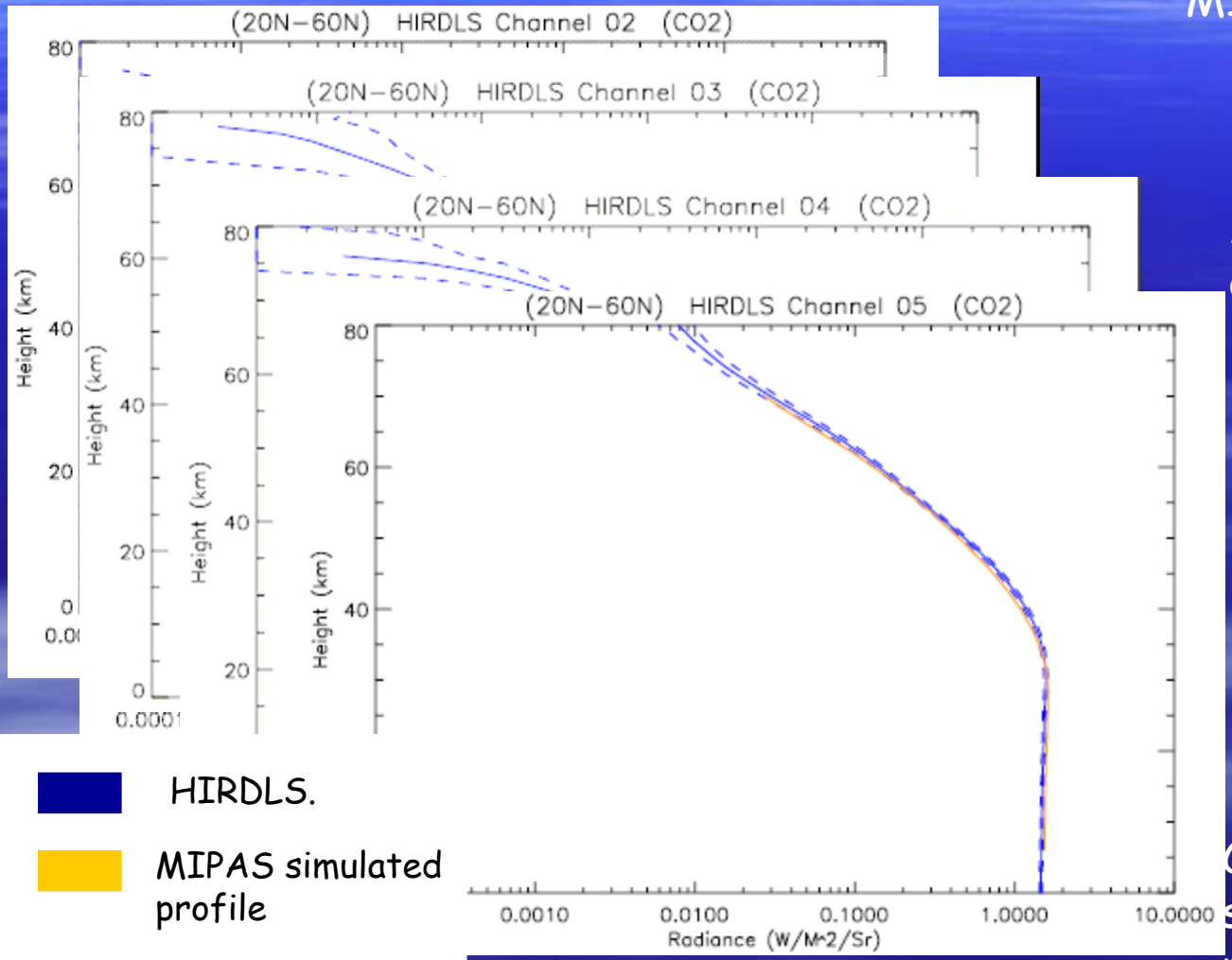
Ozone retrieval comparison

28th January 2005 — 4th May 2006





In-direct radiance comparison



MIPAS retrievals.

Averaged over one day.

Forward model run for full spectral range of HIRDS using MIPAS retrieved atmosphere.

Compare HIRDLS with simulated MIPAS radiances.

MIPAS / HIRDLS Altitude Shift

- Least squares fit method used
- Calculations using the 28th January data set
- Altitude shift calculated from direct comparisons in black
- Altitude shift calculated from in-direct comparisons in aqua

Conclusions

- There is good agreement between the HIRDLS and MIPAS zonally averaged radiances .
- Seems to be a gain offset for the 4th May data.
- The Temperature and O_3 retrievals agree well for 28th January 2005 and 4th May 2006. More detailed structure seen for 4th May 06
- In-direct radiance comparisons show good agreement in for the temperature channels

Future work

- Calculate an altitude shift for 4th may 06.
- Run the comparisons using v2.02.

Thank you for your attention